

## ROUND 13

### TOSS-UP

- 1) **BIOLOGY** *Multiple Choice* The Hardy-Weinberg equilibrium assumes which of the following:
- W) large populations, random mating, and no net mutations
  - X) small populations, random mating, and no net mutations
  - Y) large populations, non-random mating, and no net mutations
  - Z) small populations, non-random mating, and no net mutations

ANSWER: W) LARGE POPULATIONS, RANDOM MATING, AND NO NET MUTATIONS

### BONUS

- 1) **BIOLOGY** *Multiple Choice* Which of the following would be least likely to be classified as an endocrine hormone:
- W) insulin
  - X) glucagon
  - Y) oxytocin
  - Z) interleukin-2

ANSWER: Z) INTERLEUKIN-2

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### TOSS-UP

- 2) **CHEMISTRY** *Multiple Choice* Which of the following is NOT true of the Kinetic Molecular Theory of gases:
- W) gases consist of molecules or atoms in continuous random motion
  - X) collisions between these molecules and/or atoms in a gas are elastic
  - Y) the volume occupied by the atoms and/or molecules in a gas is large
  - Z) the attractive forces between the atoms and/or molecules in a gas are negligible

ANSWER: Y) THE VOLUME OCCUPIED BY THE ATOMS AND/OR MOLECULES IN A GAS IS LARGE

(Solution: the volume occupied by the atoms and/or molecules in a gas is negligible)

### BONUS

- 2) **CHEMISTRY** *Short Answer* What is the common household name for para-dichloro-benzene?

ANSWER: MOTH BALLS

### TOSS-UP

3) PHYSICS *Multiple Choice* In Erwin Schrodinger's model of the atom, he replaced electrons with:

- W) positrons
- X) electrons of opposite spin
- Y) de Broglie waves
- Z) atomic spectra

ANSWER: Y) DE BROGLIE WAVES

### BONUS

3) PHYSICS *Short Answer* According to the standard model of particle physics, how many of the leptons have an electric charge?

ANSWER: 3

(Solution: muon, electron and tau)

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### TOSS-UP

4) ASTRONOMY *Multiple Choice* Which of the following is NOT an example of a spiral galaxy:

- W) barred galaxy
- X) normal galaxy
- Y) Harlow galaxy
- Z) Seyfert galaxy

ANSWER: Y) HARLOW GALAXY

### BONUS

4) ASTRONOMY *Short Answer* By the fourth minute after the birth of the universe, nuclear physicist have shown that hydrogen-1 could have fused to form what four other isotopes?

ANSWER: HYDROGEN-2 (DEUTERIUM); HYDROGEN-3 (TRITIUM); HELIUM-4; AND LITHIUM-7

### TOSS-UP

5) MATH *Multiple Choice* The scale on a blueprint of a bicycle indicates  $\frac{1}{2}$  inch equals 1 foot. What will be the actual diameter of the bicycle wheels if they are drawn with a radius of  $\frac{3}{4}$  inches:

- W) 1  $\frac{1}{2}$  feet
- X) 2 feet
- Y) 3 feet
- Z)  $\frac{3}{4}$  feet

ANSWER: Y) 3 FEET

### BONUS

5) MATH *Short Answer* If  $f(x) = x^3 + 2x - 1$ , then  $f(2 - a)$  equals what?

ANSWER:  $11 - 14a + 6a^2 - a^3$

(Solution:  $(2 - a)^3 + 2(2 - a) - 1 = 8 - 3 \times 4 \times a + 3 \times 2 \times a^2 - a^3 + 4 - 2a - 1 = 11 - 14a + 6a^2 - a^3$ )

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### TOSS-UP

6) EARTH SCIENCE *Multiple Choice* Which is generally considered the most important factor in the metamorphism of rocks:

- W) oxidation state
- X) chemical composition
- Y) presence of water
- Z) temperature

ANSWER: Z) TEMPERATURE

### BONUS

6) EARTH SCIENCE *Short Answer* Eroding ice sheets sometimes mold smooth, nearly parallel ridges of sediment or bedrock that are elongated parallel to the direction of ice flow. These are called:

ANSWER: DRUMLINS

### TOSS-UP

7) GENERAL SCIENCE *Multiple choice* Diabetes Type I (read as: Type one) usually affects which of the following groups of people:

- W) old
- X) young
- Y) middle aged
- Z) all age groups equally

ANSWER: X) YOUNG

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### BONUS

7) GENERAL SCIENCE *Short Answer* The process by which ice melts under pressure and almost immediately re-freezes when the pressure is removed, is called:

ANSWER: REGELATION

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### TOSS-UP

8) GENERAL SCIENCE *Multiple Choice* The most important reason that most programs ran faster under Windows 95 than under Windows 3.1 was because:

- W) it took advantage of 16-bit processors
- X) it removed many of the DOS limitations
- Y) it took advantage of 32-bit processors
- Z) it eliminated the command-line interface

ANSWER: Y) IT TOOK ADVANTAGE OF 32-BIT PROCESSORS

### BONUS

8) GENERAL SCIENCE *Multiple Choice* In Java, locking on a static method of a particular class will:

- W) use a class-wide lock for the Class object of this class
- X) not affect other instances of that class
- Y) not be allowed because locks apply only to objects
- Z) only allow invocation of other synchronized methods of that class

ANSWER: W) USE A CLASS-WIDE LOCK FOR THE CLASS OBJECT OF THIS CLASS

### TOSS-UP

9) **BIOLOGY** *Multiple Choice* When each double-stranded daughter DNA contains one parental strand and one newly synthesized strand, it is referred to as what kind of replication:

- W) conservative
- X) dispersive
- Y) semi-conservative
- Z) non-conservative

ANSWER: Y) SEMI-CONSERVATIVE

### BONUS

9) **BIOLOGY** *Short Answer* Since the germ that causes leprosy is very slow growing in laboratory test tube cultures, this animal has been the most successful replacement to culture the germ:

ANSWER: ARMADILLO

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### TOSS-UP

10) **CHEMISTRY** *Multiple Choice* Which of the following does NOT contain a heterocyclic amine:

- W) cyclohexane
- X) chlorophyll
- Y) hemoglobin
- Z) purine

ANSWER: W) CYCLOHEXANE

### BONUS

10) **CHEMISTRY** *Multiple Choice* Which of the following would have the highest melting point:

- W) a 14-carbon saturated fatty acid
- X) a 16-carbon saturated fatty acid
- Y) an 18-carbon saturated fatty acid
- Z) an 18-carbon unsaturated fatty acid

ANSWER: Y) AN 18-CARBON SATURATED FATTY ACID

(Solution: W=54 C, X=63 C, Y=70 C, Z=14 C)

### TOSS-UP

11) PHYSICS *Multiple Choice* Now known to be incorrect, Helmholtz and Kelvin thought the basic source of stellar energy was:

- W) fusion
- X) fission
- Y) gravitation
- Z) neutron capture

ANSWER: Y) GRAVITATION

(Solution: Helmholtz and Kelvin didn't know about fusion)

### BONUS

11) PHYSICS *Short Answer* Assume air resistance is negligible and that gravitational acceleration is 9.8 meters per second squared. Rounded to the first decimal place, what is the velocity acquired by a body in free fall, starting from rest, after 4 seconds?

ANSWER: 39.2 METERS/SECOND

(Solution:  $v = gt; = 9.8 \times 4 = 39.2$ )

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### TOSS-UP

12) ASTRONOMY *Multiple Choice* A nearby spiral galaxy that contains a very energetic, bright central nucleus is known as a:

- W) Seyfert Galaxy
- X) Shapley Galaxy
- Y) quasar
- Z) pulsar

ANSWER: W) SEYFERT GALAXY

### BONUS

12) ASTRONOMY *Short Answer* At various distances from the Sun, the areas where very few asteroids orbit are called:

ANSWER: KIRKWOOD GAPS

### TOSS-UP

13) MATH *Short Answer* During the study of what biological phenomenon concerning what animal did Fibonacci discover the sequence bearing his name?

ANSWER: THE PROGENY (OR MULTIPLICATION) OF RABBITS

### BONUS

13) MATH *Multiple Choice* The Fibonacci sequence begins with the numbers 0, 1, 1, 2, 3, 5, and 8. If the 11<sup>th</sup> and 12<sup>th</sup> terms of the sequence are 55 and 89, respectively, what is the 13<sup>th</sup> term:

- W) 102
- X) 121
- Y) 144
- Z) 163

ANSWER: Y) 144

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### TOSS-UP

14) EARTH SCIENCE *Multiple Choice* In glaciology, what is the name for the depression formed when a block of ice, which is buried in a till, melts:

- W) kame
- X) esker
- Y) kettle
- Z) cirque

ANSWER: Y) KETTLE

### BONUS

14) EARTH SCIENCE *Short Answer* An optical effect in the atmosphere that is a result of sunlight passing through a thin layer of ice crystals, produces the illusion of 2 bright spots on either side of the sun which are called:

ANSWER: SUN DOGS (ACCEPT: PARHELIA OR MOCK SUNS)

### TOSS-UP

15) GENERAL SCIENCE *Short Answer* This behavioral scientist's position on conditioning and reinforcement was influenced by the writings of Ernst Mach, Henri Poincare, and Bertrand Russell:

ANSWER: B. F. SKINNER

### BONUS

15) GENERAL SCIENCE *Short Answer* How many picometers (pronounced: PIE-co-meters) are in a nanometer?

ANSWER: 1000 (ACCEPT:  $10^3$  OR TEN TO THE THIRD POWER)

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### TOSS-UP

16) GENERAL SCIENCE *Multiple Choice* In Java, all objects, including arrays, implement the methods of this class:

- W) class
- X) object
- Y) array
- Z) system

ANSWER: X) OBJECT

### BONUS

16) GENERAL SCIENCE *Multiple Choice* Which is NOT a type of data model used to define the structure of a database:

- W) picture-based model
- X) object-based logical model
- Y) record-based logical model
- Z) physical model

ANSWER: W) PICTURE-BASED MODEL

### TOSS-UP

17) **BIOLOGY** *Multiple Choice* What is a flower called if it is cut longitudinally through the middle and produces 2 halves that are mirror images of each other:

- W) actinomorphic
- X) polymorphic
- Y) bimorphic
- Z) zygomorphic

ANSWER: W) ACTINOMORPHIC

### BONUS

17) **BIOLOGY** *Multiple Choice* What would the fruit be known as if the separate carpels of one gynoecium (pronounced: GINE-ee-sea-um) fuse during development:

- W) simple fruit
- X) aggregate fruit
- Y) multiple fruit
- Z) complex fruit

ANSWER: X) AGGREGATE FRUIT

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### TOSS-UP

18) **CHEMISTRY** *Multiple Choice* Knowing that copper is below iron in the activity series of metals in aqueous solutions, which of the following would you expect when copper metal is added to a solution of iron (II) sulfate:

- W) the copper metal will be oxidized to form the copper cation
- X) the copper reacts to form hydrogen gas
- Y) the iron cation will be reduced to iron metal
- Z) no reaction occurs

ANSWER: Z) NO REACTION OCCURS

### BONUS

18) **CHEMISTRY** *Short Answer* What is the name of the element that is one of the softest metals known, reacts with oxygen to produce superoxides, is used inside vacuum tubes to maintain a vacuum, and whose naturally occurring isotope is used as the world's official measure of time:

ANSWER: CESIUM (ACCEPT: Cs)

### TOSS-UP

19) PHYSICS *Multiple Choice* The brilliance of a cut diamond is in great part because of its:

- W) low critical angle and high index of refraction
- X) low index of refraction
- Y) pure carbon content
- Z) high critical angle and high index of refraction

ANSWER: Z) HIGH CRITICAL ANGLE AND HIGH INDEX OF REFRACTION

### BONUS

19) PHYSICS *Short Answer* Assume a gravitational acceleration of 10 meters per second squared and negligible air resistance: If a worker drops a tool off a high rise building and the tool strikes the ground in 5 seconds, what is the height of the building and what is the tool's speed when it hits the ground?

ANSWER: BUILDING HEIGHT IS 125 METERS AND THE SPEED OF THE TOOL IS 50 METERS PER SECOND

(Solution:  $h = 1/2 g t^2 = 5 \times 25 = 125$ ,  $v = gt = 10 \times 5 = 50$ )

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### TOSS-UP

20) ASTRONOMY *Multiple Choice* Which of the following is NOT true of the class of meteorites called carbonaceous chondrites:

- W) they make up less than 10% of all meteorites
- X) they contain as much as 20% of water
- Y) they are rich in organic compounds
- Z) they show substantial evidence of being subjected to high-temperature metamorphic processes

ANSWER: Z) THEY SHOW SUBSTANTIAL EVIDENCE OF BEING SUBJECTED TO HIGH-TEMPERATURE METAMORPHIC PROCESSES

### BONUS

20) ASTRONOMY *Short Answer* Bode's Law, which was believed to correctly describe the distance of the planets from the Sun, breaks down in its ability to correctly predict planetary positions after what planet?

ANSWER: URANUS

**TOSS-UP**

21) MATH *Short Answer* What is the common mathematical term for the plane curve traced by a fixed point on a circle as it rolls along the outside of a fixed circle?

ANSWER: EPICYCLOID

**BONUS**

21) MATH *Short Answer* In an epicycloid, if the rolling circle has a radius equal to that of the fixed circle, how many arches will the epicycloid have:

ANSWER: 1

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**TOSS-UP**

22) EARTH SCIENCE *Multiple Choice* A slow-moving warm front is followed by a fast-moving cold front which overtakes the warm front and lifts the warm air entirely aloft, forming what kind of front:

- W) stationary
- X) occluded
- Y) wave
- Z) pressure

ANSWER: X) OCCLUDED

**BONUS**

22) EARTH SCIENCE *Multiple Choice* The relative amount of oxygen at the Summit of Mount Everest versus sea level is:

- W) the same
- X) less than
- Y) greater than
- Z) dependent on the temperature

ANSWER: W) THE SAME

(Solution: 20.9% by volume in each case)

### TOSS-UP

23) BIOLOGY *Multiple Choice* In plants, the xylem does which of the following:

- W) moves water and minerals to roots
- X) moves sugar to leaves and stems
- Y) moves water and minerals to leaves and stems
- Z) moves sugar to roots

ANSWER: Y) MOVES WATER AND MINERALS TO LEAVES AND STEMS

### BONUS

23) BIOLOGY *Multiple Choice* The principal features of an EKG recording are named after the letters P,Q,R,S, and T. The peak labeled by the letter "R" represents what heart action:

- W) atrial depolarization
- X) ventricular depolarization
- Y) atrial repolarization
- Z) ventricular repolarization

ANSWER: X) VENTRICULAR DEPOLARIZATION

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### TOSS-UP

24) CHEMISTRY *Multiple Choice* When a strip of magnesium metal is placed in hydrochloric acid, which of the following occurs:

- W) the hydronium ion is oxidized
- X) the magnesium is reduced by the acid
- Y) hydrogen gas is produced
- Z) no reaction takes place

ANSWER: Y) HYDROGEN GAS IS PRODUCED

(Solution:  $H^+$  is reduced  $\rightarrow H_2$ ; Mg is oxidized  $\rightarrow MgCl_2$ )

### BONUS

24) CHEMISTRY *Short Answer* In a flame test for lithium, sodium, potassium, and magnesium, which gives off a deep purple color:

ANSWER: POTASSIUM (ACCEPT: K)

**TOSS-UP**

25) PHYSICS *Multiple Choice* A 100 horsepower engine is approximately the same as a:

- W) 15 kilowatt engine
- X) 35 kilowatt engine
- Y) 55 kilowatt engine
- Z) 75 kilowatt engine

ANSWER: Z) 75 KILOWATT ENGINE

**BONUS**

25) PHYSICS *Short Answer* What is the SI unit of magnetic flux that is equal to a tesla-meter squared?

ANSWER: WEBER